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National Trends in Visits to Physician Offices and Outpatient Clinics for Angina 1995 to 2010

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Abstract

Background—We asked whether visits to physician offices and hospital outpatient clinics for angina have changed over time and whether more frequent use of certain diagnostic techniques or referrals in this setting may account for such changes.

Methods and Results—We combined data from the National Ambulatory Medical Care Survey and the National Hospital Ambulatory Medical Care Survey to study visits to physician offices and outpatient departments. We calculated both crude and standardized rates for these visits using a modified version of technical specifications published by the Agency for Healthcare Research and Quality. In 1995 to 1998, there were on average 3.6 million office/clinic visits each year for angina among adults in the United States. By 2007 to 2010, this had declined to 2.3 million visits each year. Angina visit rates per 100 000 declined significantly ($P<0.05$), with the greatest decline from 1995 through 1998 to 2003 through 2007. Coronary atherosclerotic disease diagnoses also declined after 2002. Both stress testing and referring patients out for care doubled during some study periods.

Conclusions—Office and clinic visits for angina have declined over time. This trend parallels findings for both preventable hospitalization and emergency room visits for angina. Previous research's decline in angina hospitalizations is not likely attributable to decreased referrals to hospital and emergency rooms for diagnosis and management. Although changes in *International Classification of Diseases, Ninth Revision, Clinical Modification* coding guidelines may explain some of the decline in angina and coronary atherosclerotic disease visits, it seems that other factors such as improved treatment or prevention may have played an additional role.

Keywords

ambulatory care; epidemiology; health services research; office visits

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Disclosures

None.

Little is known about secular changes in angina visits in the outpatient setting. Most research on angina visits has focused on preventable hospitalizations and emergency room visits for angina, which are believed to capture the failure of the outpatient healthcare system to prevent and control cardiovascular disease risk factors.[1] For example, an inability to access care or exposure to poor quality care can lead to a hospitalization that might have been prevented. The Agency for Healthcare Research and Quality (AHRQ) has developed a clear case definition for a preventable hospitalization (known by AHRQ as a prevention quality indicator).[1] For patients with coronary and other atherosclerotic diseases, clinical guidelines suggest that aggressive, comprehensive risk factor management is likely to improve these patients' lives by reducing the number of procedural interventions they require, possibly resulting in reduced hospitalizations.[2]

Secular declines in rates of preventable hospitalizations for angina have been reported by several researchers.[3–5] Although 1 researcher[5] suggested that this may partially be attributable to increased use of emergency departments, a recent research study[6] shows that rates have also declined in emergency rooms. Based on observing increasing rates of hospitalization for coronary atherosclerosis and increased use of coronary angiography from 1992 to 1999, another researcher has suggested that these declines in rates reflect trends in more aggressive diagnosis of coronary atherosclerosis, which led to different discharge diagnoses.[7]

The purpose of this study is to fill a gap in the existing scientific literature by examining secular changes in angina visits in the outpatient setting. This will be done by examining rates of visits for angina, defined using a modified version of the AHRQ's definition for prevention quality indicator No. 13,[7] to determine whether they have declined in physician offices and hospital outpatient clinics. We also propose to shed additional light on previous research showing declines in rates of visits for angina in hospitals and emergency rooms by examining whether outpatient physicians are more likely to provide or order tests for the diagnosis and management of angina over time and whether they are more likely to refer patients to other physician offices, hospitals, or emergency rooms.

Methods

Data Source and Definitions

We obtained office-based physician visit data from the National Ambulatory Medical Care Survey (NAMCS) and combined those data with hospital outpatient clinic visit data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) for the years 1995 to 2010. Both surveys were conducted by the National Center for Health Statistics (NCHS).[8,9] All research activities related to the surveys were reviewed and approved by the NCHS Research Ethics Review Board in accordance with 45 Code of Federal Regulations 46. NAMCS and NHAMCS are stratified probability-designed surveys. The NAMCS has 3 stages of sampling, and the NHAMCS has 4 stages. For NAMCS, at the first and second stages of sampling, the survey selects office-based physicians (from the American Medical Association and American Osteopathic Association files) in geographic areas of the United States (as selected in earlier NCHS surveys). At the third stage, patient visits within practices are selected during a 1-week physician reporting period. For NHAMCS, at the first and second stages of sampling, the survey selects noninstitutional hospitals in these same geographic areas of the United States, exclusive of federal, military, and Veterans Administration hospitals. Only short-stay hospitals (ie, average length of stay <30 days for all patients) and general hospitals (medical or surgical) are included in the surveys. Hospitals must also have ≥6 beds available for inpatient use. At the third stage, either all or a sample of clinics from outpatient departments (OPDs) are selected from each hospital. At the final stage, NCHS selects a systematic sample of patient visits over a randomly assigned 4-week reporting period from the outpatient clinics of the participating hospitals.

The data collection for the surveys is expected to be performed by the physician, physician's staff, or clinic staff; however, it is often performed by census field representatives. Data from the visit are transcribed onto a patient record form. Checks for completeness are made by field staff, clerical edits are performed after data are sent for central processing, and computer edits for code ranges and inconsistencies are also performed. Keying and coding error rates generally range between 0% and 1% for various survey items. Item nonresponse is generally ≤5%.

From 1995 to 2010, the response rates for the physicians in NAMCS ranged from 59% to 73%. In NHAMCS, during the same time period, the response rates for hospitals ranged from 89% to 98%. From the hospitals with OPDs, 80% to 90% of OPDs agreed to provide survey information. Within OPDs, 85% to 96% of the targeted clinics responded with information on patient visits.

Because this study was conceived after questions were raised during our previous studies on preventable hospitalizations,[6] we calculated angina visit rates using the same *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) codes we used previously, which are detailed in the technical specifications published by AHRQ for prevention quality indicator No. 13.[7] The numerator consists of all nonmaternal visits for persons ≥18 years of age with the following diagnoses listed on the patient record form as being related to the sampled visit: intermediate coronary syndrome, including unstable angina (411.1), coronary occlusion without myocardial infarction (411.81), acute ischemic heart disease (411.89), angina decubitus (413.0), prinzmetal angina (413.1), and angina pectoris (413.9). Because there are only 3 places to record a diagnosis on the NAMCS and NHAMCS patient record forms, we used all 3 to flag a visit for angina. Pre-existing conditions were recorded in another section of the patient record form. In both databases, we excluded maternal visits using a method based on *ICD-9* codes alone.[10] Other exclusions required by the specifications include transfers from another institution and visits with selected cardiac procedure codes (eg, grafts, open heart surgery, valvotomies, pacemaker implants) in any field. We did not exclude these because transfers in an ambulatory care setting have a different meaning than transfers into a hospital, and cardiac procedures of this type (mainly complex surgical) are generally done only in the hospital. Although not a main focus of this study, we did compare rates of angina visits with rates of coronary atherosclerotic disease (CAD) visits to better explain the results of our analysis. We used *ICD-9* codes of 414.0× to flag visits for CAD.

The denominators for the rates are from US Census Population Estimates[11] published by NCHS as part of the documentation package for each year's survey database.[8,9]

In describing the characteristics of visits for angina, we used 3 categories for race: white, black, or other. In calculating rates, we did not stratify by race because of sample size concerns. We used 4 census regions: Northeast, Midwest, South, and West (US Census Bureau 2000).[11] For insurance, we used only the principal expected source of payment to derive 4 categories: Medicare, Medicaid, private insurance, and other. Other category included types such as other government insurance, self-pay, no charge or charity care, and worker's compensation. We did not have a large enough sample size to study the other types of insurance individually. Source of payment was considered missing and excluded from the calculation of percentages if the patient record form had the unknown box checked.

To test whether physicians are more likely to provide or order tests for the diagnosis and management of angina over time or to refer them to another provider, we focused on 3 variables: (1) ECGs ordered or provided; (2) stress tests ordered or provided; and (3) referrals to another doctor, a hospital, an emergency room, or another facility. For ECG, in those years (1997–2010) where there was a checkbox on the patient record form indicating that an ECG had been ordered or provided, we simply counted the number of times that the box was checked. Because there was no checkbox for 1995 or 1996, we scanned all write-in information indicating that additional tests or procedures had been ordered for the *ICD-9-CM* code 8952. There were no checkboxes for stress testing in any of the years that we studied. We scanned all write-in information for the *ICD-9-CM* codes of 8941 to 8944. For referrals, we summed across the following: an NCHS constructed diagnostic code used to indicate transfer to another facility or having been sent to see a specialist (V992-), disposition codes that indicated a referral to a hospital or an emergency room, and a variable indicating referral to another physician.

Statistical Analysis

Angina Visit Rates and Trends Over Time—We estimated the total weighted number of outpatient visits for angina each year for persons ≥18 years of age in the United States by using the patient sampling weights in the database. Because angina as a primary reason for a visit is relatively rare, we looked at all 3 recorded diagnoses and then combined 4 years of data to obtain 4 time periods: 1995 to 1998, 1999 to 2002, 2003 to 2006, and 2007 to 2010. We summed the census population estimates over these same time periods and used these sums to calculate visit rates per 100 000 population.

We stratified the population by age (18–64 and ≥65 years) and sex. We used only 2 age categories because using more resulted in large standard errors for point estimates. We also produced age- and sex-standardized rates using the 2000 US Census Population as the standard population.[11]

Because of the complex sampling design, we used SUDAAN[12] to calculate 95% confidence intervals (CIs) around the estimates. We did not calculate CIs around the denominators because they were derived from a census of the population. We calculated standard errors for visit rates. We tested differences between subgroups using *t* tests with α=0.05 as a measure of statistical significance; however, this testing was only done for estimates that were considered reliable according to NCHS standards (ie, estimates based on ≥30 visits and those where the relative standard error is ≤30%). We used the weighted least squares regression test for linear trends for each study subgroup and for the age- and sex-specific rates.[12] To examine the assumption of linearity, we examined residuals plotted against the independent variable to verify that the residuals were randomly distributed.

Characteristics of Angina Visits—We used Proc Crosstab in SUDAAN[12] to create percentages and associated 95% CIs for visits by age, sex, race, region, and insurance status.

Medical Care Ordered or Provided—We used Proc Descript in SUDAAN[12] to calculate the percentage of visits where ECGs, stress tests, or referrals were ordered or provided. Finally, we used RLOGIST in SUDAAN[12] to determine whether the provision/ordering of ECG testing, stress testing, or specialty care had changed over time after adjustments for differences in the age and sex distribution of the angina visit population at various times.

Results

From 1995 to 2010, there were 2474 records for which angina was listed as any diagnosis among persons ≥18 years of age in either the NAMCS physician office visits or the NHAMCS OPD visits. This translates to a weighted estimate of 43 142 005 of these visits in the United States for 16 years, an average of ≈2.7 million each year.

In every period, the majority of visits for angina (from 57% to 65%) occurred in persons ≥65 years of age (Table 1). Also, we found the likelihood of having a visit for angina (compared with having a visit for something else) increased by age (β=0.05; P<0.0001; data not shown). The distribution of visits did not vary significantly by sex. As would be expected, given the distribution of the population, 80% to 90% of the visits were made by white patients. In 1995 to 1998, approximately one quarter of the visits occurred in the Southern US census region; however, by 2007 to 2010, half of the visits occurred in this region. Only 13% of visits occurred in the Northeastern region from 2007 to 2010. The largest expected payer for these visits was Medicare (range, 57%–65%), depending on the period. Private insurance was the second largest expected payer (range, 23%–33%). In 2007 to 2010, Medicaid was expected to pay for ≈8% of these visits.

For women and men, the crude angina visit rates per 100 000 population were significantly larger for those ≥65 years of age, compared with those in the younger age group (Table 2). For women ≥65 years of age, the rates dropped significantly in the earlier years (1995–1998) versus the latter (2007–2010). For men in both age groups, rates dropped significantly from the first period to the third and then leveled off. The highest crude rates occurred in 1995 to 1998 among women (6659/100 000) and men (8533/100 000) ≥65 years of age.

We first tested whether age- and sex-standardized visit rates for angina declined in a linear fashion across the 4 time periods (Figure). The linear trend was of borderline significance (P<0.10). Because the largest decline appeared to be from the first (1995–1998) to the third

(2003–2006) time period, we then formally tested whether this decline was linear. We found that rates declined in a statistically significant linear fashion ($\beta=-482/100\,000$; $P=0.05$) across these time periods. During those years, the actual rate declined by ≈50%, from 1856.6/100 000 to 902.3/100 000. The rate then increased slightly to 982.8/100 000 in the last period. CAD visit rates were much higher than angina visit rates, and the rate increased initially from the first to the second period (from 6152.3/100 000 to 7708.1/100 000), and then rates declined after that to a low of 5459.8/100 000.

The crude percentage of angina visits where an ECG was either ordered or provided was relatively flat over time, ranging from 25% to 33% of visits (Table 3). Stress testing over the same period ranged from 7% to 13%. Referrals to another provider, a hospital, or an emergency room ranged from 8% to 15% of visits. Age- and sex-adjusted rates (Table 4) of these types of medical care showed that the likelihood of stress testing doubled during the second (odds ratio, 2.1; 95% CI, 1.2–3.6) and third (odds ratio, 2.1; 95% CI, 1.1–3.8) periods compared with 1995 to 1998, and the fourth period odds ratio was 1.3, which was not different from baseline. Also, the likelihood of visits being associated with a referral doubled (odds ratio, 2.1; 95% CI, 1.0–4.3) from 1999 through 2002 to 2007 through 2010.

Discussion

We asked whether angina visits have declined over time in the outpatient setting. We found that physician office and hospital outpatient clinic visits for angina have declined from the mid-1990s through 2003 to 2006. This decline parallels the declines already noted in earlier studies of the inpatient and emergency room settings.[3–6] We also asked whether physicians are diagnosing/managing angina more often in their offices. Although screening using a resting ECG is not recommended by the US Preventive Services Task Force,[13] using an ECG to better understand angina symptoms is recommended.[14] The percentage of ECGs ordered or provided to persons with angina did not change over time. On the contrary, we found that ordering or provision of stress tests during office visits for angina has increased from the mid-1990s through 2006 and that patient referrals have increased from the late 1990s through 2010. Thus, the reason for declining rates of angina in hospitals and emergency rooms is probably not that physicians fail to send patients to hospitals, emergency rooms, or other providers for diagnosis or management.

Possible explanations for this decline include a true declining prevalence of angina, based on improvements in heart disease risk factors over time; and a move to better understand the causes of angina, a better ability to do so, and *ICD-9-CM* coding guidelines designed to reflect these changing physician practices.

Unfortunately, it is extremely difficult to find published estimates of secular trends for angina prevalence in the United States. We found no studies that covered the period of our study, and we found only 1 study[15] that covered an earlier time period. Participants' responses to questions from the Rose Questionnaire[16] on angina symptoms were used to determine prevalence among adults 40 to 74 years of age from the early 1970s through the mid-1990s. During this period, rates were relatively flat. During the time frame of our study, however, several key risk factors for atherosclerosis have declined. There is clear evidence that high low-density lipoprotein cholesterol values for adults 40 to 74 years of age have decreased substantially from 59% to 27% during the late 1970s and through 2007 to 2010.[17] Smoking prevalence and air pollution have also declined since the 1980s.[18,19] Also, blood pressure control has increased to an estimated 50% of all patients with hypertension in National Health and Nutrition Examination Survey 2007 to 2008, with most of the improvement since 1988 occurring after 1999 to 2000.[20] However, because other risk factors such as overweight, diabetes mellitus, and physical inactivity have increased over time,[18] it is not known whether these setbacks would offset the gains expected in reducing atherosclerosis.

We found no studies of regional differences in trends of angina prevalence that might explain our puzzling finding that almost 50% of angina visits occurred in the Southern US region from 2007 to 2010. It seems that the prevalence in the South remained relatively flat because other regions experienced a decline in angina visits. Because few data are available to help us understand this, we can only speculate that this might be attributable to a lag in the aggressiveness of diagnosing CAD or a lag in the adoption of *ICD-9* coding changes (see below) or an increase in the population with angina symptoms in the South, either through in-migration or a worsening of existing heart disease risk factors. Evidence suggests that the South has experienced disproportionate increases in both diabetes mellitus and obesity.[21]

Since the early 1990s, *ICD-9-CM* coding guidelines for angina have changed by moving angina from a primary diagnosis to a secondary diagnosis (when the cause is known) or by dropping angina from the coding altogether (when it is clear that a patient has had an acute myocardial infarction).[22] Because these coding guidelines changes are adopted, one would expect that angina would be less frequently listed as a diagnostic code. This is especially true because the diagnostic technology used to distinguish angina, coronary atherosclerosis, and myocardial infarction has rapidly evolved. There is clear evidence that the use of imaging stress tests and cardiac catheterization increased from 1993 through 2001 in the Medicare population.[23] Saver et al[3] have provided evidence that the decline in preventable angina hospitalizations from 1992 to 1999, in part, stems from more aggressive diagnosis of coronary atherosclerosis. Bertoni et al[5] conducted research on angina hospitalizations and showed that it is not just a matter of having moved angina from its position as a primary diagnosis to a nonprimary diagnosis. Angina recorded as any hospital diagnosis also declined during the period 1988 to 2001. Our findings from 1995 to 2002 support previous findings that angina rates declined while CAD rates increased. However, our data after 2002 show that both angina and CAD rates have declined. Although it is possible that the same coding changes that have occurred in the hospital setting have also occurred in the outpatient setting during the earlier time period; it also appears that angina visits may be declining attributable to other factors such as a declining prevalence of the symptoms of angina.

Both angina and CAD are conditions that are considered manageable, if not preventable, in outpatient and community settings. Highly recommended evidence-based management strategies in the outpatient setting include low-density lipoprotein cholesterol lowering to targets based on initial risk, aspirin therapy, and use of renin–angiotensin–aldosterone system blockers and β-blockers for selected at-risk patients.[2] Other recommended strategies include smoking cessation, blood pressure control, participation in physical activity, improved nutrition, weight management, and diabetes mellitus management.[2] Studies have shown that aggressive risk factor management and therapeutic lifestyle changes for patients with existing coronary and other atherosclerotic vascular disease improve survival, reduce recurrent events, and improve quality of life.[24–27]

Our study contributes newly to the literature in providing data on secular trends for angina visits, using data from a representative sample of physician offices and hospital OPDs, insights into previous research showing declines in angina hospitalizations and emergency room visits by refuting a hypothesis that physicians are more often managing angina in the outpatient setting, and providing more recent information on changes in outpatient physician practices over time.

Our study also has limitations. First, because we used *ICD-9-CM* coding to flag angina visits, it is important to realize that we do not provide estimates of the prevalence of angina. To derive such estimates, one would need to obtain data on individuals from a source such as the Rose questionnaire on angina. Having this would have provided us with a more complete picture of the causes behind the reduction in angina visits in the outpatient setting. Second, in an effort to inform previous research on preventable hospitalizations and emergency room visits for angina, we used a definition that closely resembles AHRQ's technical definition of a prevention quality indicator. However, the match was not exact. We did not exclude transfers or cardiac procedures from outpatient visits, and we used all 3 diagnostic codes to flag an angina visit. This was done because we had small sample sizes if we only used the first diagnosis. Also, it was not clear that the use of first diagnosis in outpatient data has the same meaning as the principal diagnosis in hospitalization data. Third, some variables changed over the time frame of the study (eg, principal source of payment and referral patterns). Although we attempted to account for these by making appropriate coding changes, it is possible that the changes in the variables impacted our estimates over time. Fourth, we were unable to distinguish between whether services were provided in the office or were ordered to be provided in another setting. However, the aim of this part of the analysis was to simply examine whether physician behavior changed over time with regard to ordering/testing. Fifth, it was not clear whether referral to another physician was for care directly related to the management of angina. The patient record form asks for the final disposition of the visit, and 1 of the checkboxes reads referral to other physician. Finally, we were unable to conduct more in-depth analyses because of small sample sizes. We addressed some of the problems associated with this by combining data across years. However, despite the aggregation, we still were unable to conduct analyses that required further stratifications or additional multivariable adjustments.

Regardless of the reasons for the decline in angina outpatient visits, primary and secondary prevention strategies should continue to be a hallmark of care for patients with coronary artery disease. This does not remove the need for further research. To move beyond speculation, good studies of angina using standardized questionnaires such as the Rose Questionnaires are needed to understand whether angina symptomatology has changed over time in the United States. Also, more research is needed to understand the level of access and quality of care that is provided for patients with angina in the outpatient setting. With these types of studies, we could more easily determine whether, even with the complication of coding changes, the use of the prevention quality metric for angina without procedure still provides valuable insights on barriers to the outpatient system of quality care.

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References

1. Guide to Prevention Quality Indicators: Hospital Admission for Ambulatory Care Sensitive Conditions. AHRQ Publication No. 02-R0203. Rockville, MD: Agency for Health Care Research and Quality; 2007. Department of Health and Human Services, Agency for Healthcare Research and Quality. http://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/V31/pqi_guide_v31.pdf. [Accessed January 31, 2013]
2. Smith SC Jr, Allen J, Blair SN, Bonow RO, Brass LM, Fonarow GC, Grundy SM, Hiratzka L, Jones D, Krumholz HM, Mosca L, Pasternak RC, Pearson T, Pfeffer MA, Taubert KA. AHA/ACC; National Heart, Lung, and Blood Institute. AHA/ACC guidelines for secondary prevention for patients with coronary and other atherosclerotic vascular disease: 2006 update: endorsed by the National Heart, Lung, and Blood Institute. Circulation. 2006; 113:2363–2372. [PubMed: 16702489]
3. Saver BG, Dobie SA, Green PK, Wang CY, Baldwin LM. No pain, but no gain? The disappearance of angina hospitalizations, 1992–1999. Med Care. 2009; 47:1106–1110. [PubMed: 19820615]
4. Davis SK, Liu Y, Gibbons GH. Disparities in trends of hospitalization for potentially preventable chronic conditions among African Americans during the 1990s: implications and benchmarks. Am J Public Health. 2003; 93:447–455. [PubMed: 12604494]
5. Bertoni AG, Bonds DE, Thom T, Chen GJ, Goff DC Jr. Acute coronary syndrome national statistics: challenges in definitions. Am Heart J. 2005; 149:1055–1061. [PubMed: 15976788]
6. Will JC, Valderrama AL, Yoon PW. Preventable hospitalizations and emergency department visits for angina, United States, 1995–2010. Prev Chronic Dis. 2013; 10:E126. [PubMed: 23886045]
7. Prevention Quality Indicators Technical Specifications, PQ#13 Angina Without Procedure Admission Rate. Version 4.1. Rockville, MD: Agency for Health Care Research and Quality; 2009. Agency for Health Care Research and Quality. http://www.qualityindicators.ahrq.gov. [Accessed November 19, 2012]
8. [Accessed March 21, 2013] US Department of Health and Human Services, Centers for Disease Control and Prevention. National Ambulatory Medical Care Survey Questionnaires, Datasets, and Related Documents. 2013. http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm.
9. [Accessed March 21, 2013] US Department of Health and Human Services, Centers for Disease Control and Prevention. National Hospital Ambulatory Medical Care Survey Questionnaires, Datasets, and Related Documents. 2012. http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm.
10. Kuklina EV, Whiteman MK, Hillis SD, Jamieson DJ, Meikle SF, Posner SF, Marchbanks PA. An enhanced method for identifying obstetric deliveries: implications for estimating maternal morbidity. Matern Child Health J. 2008; 12:469–477. [PubMed: 17690963]
11. US Census Bureau. Washington, DC: US Census Bureau; 2000. Census 2000 Brief Series. http://www.census.gov/population/www/cen2000/briefs.html. [Accessed November 19, 2012]
12. Research Triangle Institute. SUDAAN (release 10.0) Language Manual. Research Triangle Park (NC): Research Triangle Institute; 2008. http://www.rti.org/sudaan. [Accessed September 18, 2012]
13. US Preventive Services Task Force. Screening for Coronary Heart Disease With Electrocardiography: Clinical Summary of USPSTF Recommendation. AHRQ Publication No. 11-05158-EF-3. 2012 Jul. http://www.uspreventiveservicestaskforce.org/uspstf11/coronarydis/chdsum.htm.
14. Kontos MC, Diercks DB, Kirk JD. Emergency department and office-based evaluation of patients with chest pain. Mayo Clin Proc. 2010; 85:284–299. [PubMed: 20194155]

15. Ford ES, Giles WH. Changes in prevalence of nonfatal coronary heart disease in the United States from 1971–1994. Ethn Dis. 2003; 13:85–93. [PubMed: 12723017]
16. Rose G, McCartney P, Reid DD. Self-administration of a questionnaire on chest pain and intermittent claudication. Br J Prev Soc Med. 1977; 31:42–48. [PubMed: 856370]
17. Kuklina, EV.; Carroll, MD.; Shaw, KM.; Hirsch, R. Trends in High LDL Cholesterol, Cholesterol-Lowering Medication Use, Dietary Saturated-Fat Intake: United States, 1976–2010. NCHS Data Brief. No. 117. Hyattsville, MD: National Center for Health Statistics; 2013.
18. Capewell S, Ford ES, Croft JB, Critchley JA, Greenlund KJ, Labarthe DR. Cardiovascular risk factor trends and potential for reducing coronary heart disease mortality in the United States of America. Bull World Health Organ. 2010; 88:120–130. [PubMed: 20428369]
19. Pope CA III, Ezzati M, Dockery DW. Fine-particulate air pollution and life expectancy in the United States. N Engl J Med. 2009; 360:376–386. [PubMed: 19164188]
20. Egan BM, Zhao Y, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988–2008. JAMA. 2010; 303:2043–2050. [PubMed: 20501926]
21. Yeh RW, Normand SL, Wang Y, Barr CD, Dominici F. Geographic disparities in the incidence and outcomes of hospitalized myocardial infarction: does a rising tide lift all boats? Circ Cardiovasc Qual Outcomes. 2012; 5:197–204. [PubMed: 22354937]
22. Primaris. DRG 140. ICD-9 CM Coding Guidelines. http://www.primaris.org/sites/default/files/resources/HPMP/coding%20guidelines%20booklet_DRG_140.pdf.
23. Lucas FL, DeLorenzo MA, Siewers AE, Wennberg DE. Temporal trends in the utilization of diagnostic testing and treatments for cardiovascular disease in the United States, 1993–2001. Circulation. 2006; 113:374–379. [PubMed: 16432068]
24. Baigent C, Keech A, Kearney PM, Blackwell L, Buck G, Pollicino C, Kirby A, Sourjina T, Peto R, Collins R, Simes R. Cholesterol Treatment Trialists' (CTT) Collaborators. Efficacy and safety of cholesterol-lowering treatment: prospective meta-analysis of data from 90,056 participants in 14 randomised trials of statins. Lancet. 2005; 366:1267–1278. [PubMed: 16214597]
25. Fraker TD Jr, Fihn SD, Gibbons RJ, Abrams J, Chatterjee K, Daley J, Deedwania PC, Douglas JS, Ferguson TB Jr, Fihn SD, Fraker TD Jr, Gardin JM, O'Rourke RA, Pasternak RC, Williams SV, Smith SC Jr, Jacobs AK, Adams CD, Anderson JL, Buller CE, Creager MA, Ettinger SM, Halperin JL, Hunt SA, Krumholz HM, Kushner FG, Lytle BW, Nishimura R, Page RL, Riegel B, Tarkington LG, Yancy CW. American College of Cardiology; American Heart Association; American College of Cardiology/American Heart Association Task Force on Practice Guidelines Writing Group. 2007 chronic angina focused update of the ACC/AHA 2002 Guidelines for the management of patients with chronic stable angina: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines Writing Group to develop the focused update of the 2002 Guidelines for the management of patients with chronic stable angina. Circulation. 2007; 116:2762–2772. [PubMed: 17998462]
26. LaRosa JC, Grundy SM, Waters DD, Shear C, Barter P, Fruchart JC, Gotto AM, Greten H, Kastelein JJ, Shepherd J, Wenger NK. Treating to New Targets (TNT) Investigators. Intensive lipid lowering with atorvastatin in patients with stable coronary disease. N Engl J Med. 2005; 352:1425–1435. [PubMed: 15755765]
27. Mosca L, Banka CL, Benjamin EJ, Berra K, Bushnell C, Dolor RJ, Ganiats TG, Gomes AS, Gornik HL, Gracia C, Gulati M, Haan CK, Judelson DR, Keenan N, Kelepouris E, Michos ED, Newby LK, Oparil S, Ouyang P, Oz MC, Petitti D, Pinn VW, Redberg RF, Scott R, Sherif K, Smith SC Jr, Sopko G, Steinhorn RH, Stone NJ, Taubert KA, Todd BA, Urbina E, Wenger NK. Expert Panel/Writing Group; American Academy of Physician Assistants; American Association for Clinical Chemistry; American Association of Cardiovascular and Pulmonary Rehabilitation; American College of Chest Physicians; American College of Emergency Physicians; American Diabetes Association; American Geriatrics Society; American Society for Preventive Cardiology; American Society of Echocardiography; American Society of Nuclear Cardiology; Association of Women's Health, Obstetric and Neonatal Nurses; Global Alliance for Women's Health; Mended Hearts, Inc; National Black Nurses Association; National Black Women's Health Imperative; National Women's Health Resource Center; North American Menopause Society; Partnership for Gender-Specific Medicine at Columbia University; Preventive Cardiovascular Nurses Association; Society for Vascular Medicine and Biology; Society for Women's Health Research; Society of

Geriatric Cardiology; Women in Thoracic Surgery; Women Heart: the National Coalition for Women with Heart Disease. Evidence-based guidelines for cardiovascular disease prevention in women: 2007 update. J Am Coll Cardiol. 2007; 49:1230–1250. [PubMed: 17367675]

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WHAT IS KNOWN

- Hospitalizations and emergency department visits for angina as the primary diagnosis have declined substantially since the late 1980s.
- However, angina is often managed in the outpatient setting, and whether this decline in hospital visits is attributable to a lower overall incidence of angina, or if it extends to the outpatient setting as well, is unknown.

WHAT THE STUDY ADDS

- This research shows that angina visit rates has also declined in physician offices and hospital outpatient clinics in the United States.
- Although there is not a complete understanding of the reasons for these declines, one reason is likely due to coding guidelines developed in the early 1990s that have discouraged physicians from recording angina when a more specific cause is known.
- Although it is possible that aggressive treatment of risk factors for angina may have played a role in these declines, more research is needed to confirm this.

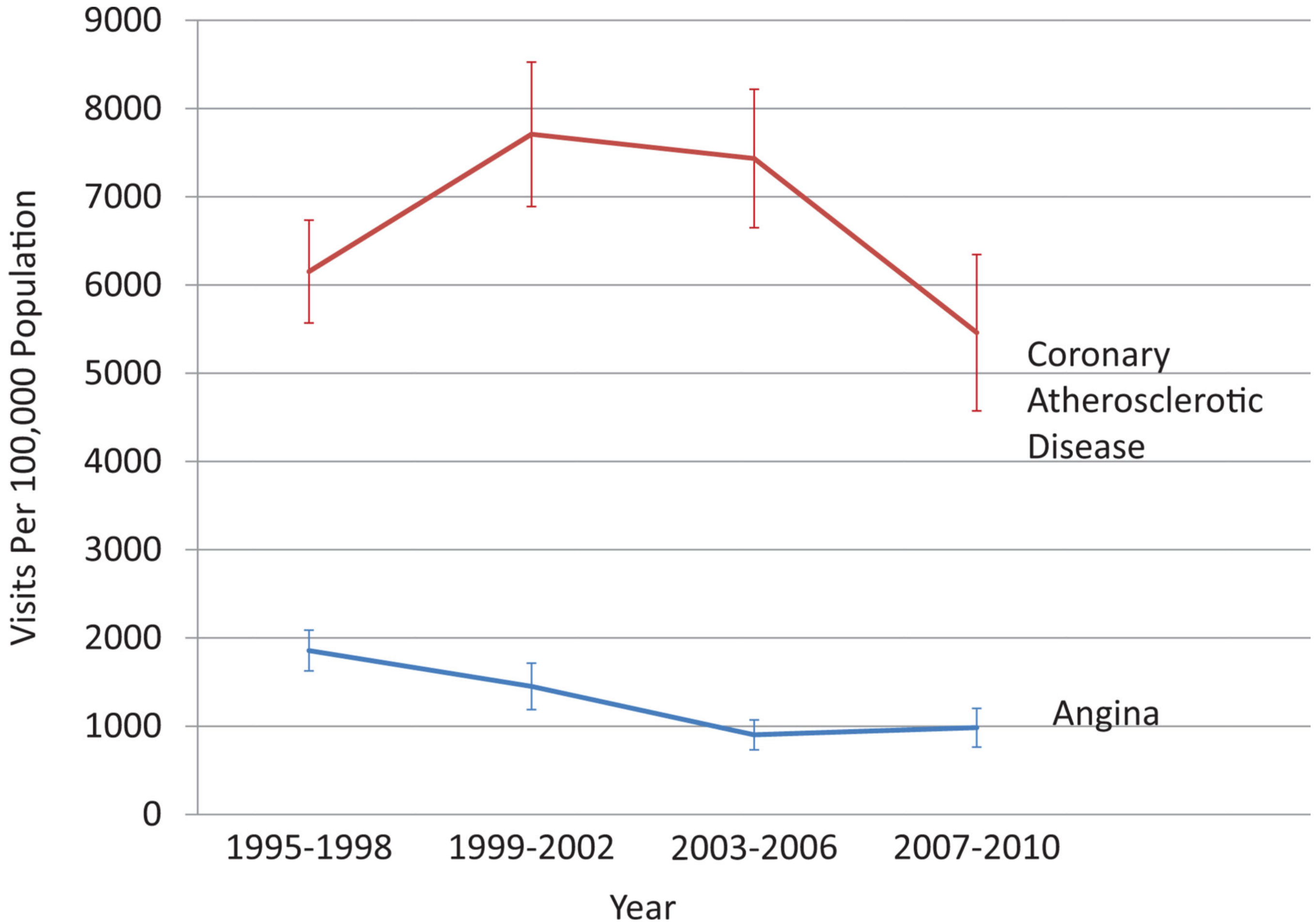

Figure.

Age- and sex-standardized rates of office visits for angina in the United States across 4 time periods compared with changes in coronary atherosclerotic disease visit rates. Data derived from National Hospital Ambulatory Medical Care Survey and National Ambulatory Medical Care Survey, 1995 to 2010. Although there is not a statistically significant decline at $P<0.05$ from the first to the last time period of the study, there is a statistically significant linear decline between the first (1995– 1998) and third (1999–2002) time period ($P<0.05$). The 2000 US Census Population was used as the standard population.

Table 1

Distribution of Office Visits for Angina, Weighted Number of Visits, and Crude Percent of Visits, by Selected Demographic Characteristics and Time Period: NHAMCS and NAMCS, 1995 to 2010

	1995–1998		1999–2002		2003–2006		2007–2010	
Characteristics	**No. (95% CI)**	**% (95% CI)**	**No. (95% CI)**	**% (95% CI)**	**No. (95% CI)**	**% (95% CI)**	**No. (95% CI)**	**% (95% CI)**
Age, y								
18–64	4 977 700 (3 908 792–6 046 608)	34.4 (28.8–40.4)	3 537 011 (2 539 374–4 534 648)	29.7 (23.4–36.9)	2 926 915 (2 019 805–3 834 025)	37.7 (31.1–44.8)	3 835 873 (2 443 183–5 228 563)	42.7 (34.0–51.8)
65+	9 513 340 (7 603 172–11 423 508)	65.7 (59.6–71.2)	8 359 899 (5 958 921–10 760 877)	70.3 (63.1–76.6)	4 839 162 (3 463 870–6 214 454)	62.3 (55.3–68.9)	5 152 105 (2 978 933–7 325 277)	57.3 (48.2–66.0)
Total	14 491 040 (13 469 058–15 513 022)	100.00	11 896 910 (10 874 928–12 918 892)	100.00	7 766 077 (6 744 095–8 788 059)	100.00	8 987 978 (7 965 996–10 009 960)	100.00
Sex								
Female	6 908 309 (5 502 574–8 314 044)	47.7 (42.9–52.5)	5 394 222 (3 844 589–6 943 855)	45.3 (38.9–51.9)	4 013 100 (2 785 919–5 240 281)	51.7 (44.0–59.2)	4 063 236 (2 659 096–5 467 376)	45.2 (38.4–52.2)
Male	7 582 731 (6 221 167–8 944 295)	52.3 (47.5–57.1)	6 502 688 (4 754 324–8 251 052)	54.7 (48.1–61.1)	3 752 977 (2 650 562–4 855 392)	48.3 (40.8–56.0)	4 924 742 (2 918 719–6 930 765)	54.8 (47.8–61.6)
Total	14 491 040 (13 469 058–15 513 022)	100.00	11 896 910 (10 874 928–12 918 892)	100.00	7 766 077 (6 744 095–8 788 059)	100.00	8 987 978 (7 965 996–10 009 960)	100.00
Race								
White	13 043 577 (10 739 297–15 347 857)	90.0 (86.2–92.8)	9 516 836 (7 216 607–11 817 065)	80.0 (70.3–87.1)	6 685 867 (4 822 329–8 549 405)	86.1 (80.2–90.4)	8 055 838 (5 135 159–10 976 517)	89.6 (85.2–92.9)
Black	1 171 216 (727 382–1 615 050)	8.1 (5.5–11.7)	1 506 400 (467 001–2 545 799)	12.7 (7.0–22.0)	686 533 (378 631–994 435)	8.8 (5.8–13.3)	684 651 (294 926–1 074 376)	7.6 (4.9–11.7)
Other*	276 247 (79 757–472 737)	1.9 (0.9–3.9)	873 674 (195 377–1 551 971)	7.3 (3.4–15.0)	393 677 (107 511–679 843)	5.1 (2.4–10.3)	247 489 (40 340–454 638)	2.8 (1.2–6.4)
Total	14 491 040 (13 469 058–15 513 022)	100.00	11 896 910 (10 874 928–12 918 892)	100.00	7 766 077 (6 744 095–8 788 059)	100.00	8 987 978 (7 965 996–10 009 960)	100.00
Region								
Northeast	4 676 642 (3,183 133–6 170 151)	32.3 (24.7–40.9)	3 649 801 (1 688 002–5 611 600)	30.7 (19.6–44.6)	1 411 332 (509 446–2 313 218)	18.2 (10.0–30.9)	1 165 838 (564 254–1 767 422)	13.1 (7.2–22.3)
Midwest	3 246 618 (2 093 471–4 399 765)	22.4 (16.2–30.1)	2 283 868 (1 152 204–3 415 532)	19.2 (11.9–29.6)	1 765 677 (1 279 648–2 251 706)	22.7 (13.7–35.2)	1 692 222 (575 655–2 808 789)	18.8 (9.6–33.5)
South	3 835 873 (2 637 563–5 034 183)	26.5 (19.9–34.2)	3 729 352 (2 293 124–5 165 580)	31.4 (21.8–42.8)	2 902 158 (1 638 470–4 165 846)	37.4 (25.8–50.6)	4 481 914 (1 690 354–7 273 474)	49.9 (32.9–66.9)
West	2 731 907 (1 871 627–3 592 187)	18.9 (13.9–25.1)	2 233 889 (1 114 817–3 352 961)	18.8 (11.5–29.1)	1 686 910 (853 502–2 520 318)	21.7 (13.5–33.1)	1 648 004 (793 784–2 502 224)	18.3 (10.3–30.4)

Characteristics	1995–1998 No. (95% CI)	1995–1998 % (95% CI)	1999–2002 No. (95% CI)	1999–2002 % (95% CI)	2003–2006 No. (95% CI)	2003–2006 % (95% CI)	2007–2010 No. (95% CI)	2007–2010 % (95% CI)
Total	14 491 040 (13 469 058–15 513 022)	100.00	11 896 910 (10 874 928–12 918 892	100.00	7 766 077 (6 744 095–8 788 059)	100.00	8 987 978 (7 965 996–10 009 960)	100.00
Insurance status								
Medicare	8 198 349 (6 436 336–9 960 362)	56.9 (50.9–62.7)	6 882 972 (4 657 007–9 108 937)	58.1 (49.1–66.6)	4 740 450 (3 284 028–6 196 872)	61.5 (54.2–68.4)	4 872 980 (2 774 519–6 971 441)	55.7 (46.6–64.4)
Medicaid	1 228 963 (724 798–1 733 128)	8.5 (5.9–12.2)	804 856 (225 152–1 384 560)	6.8 (3.4–13.1)	546 813 (252 980–840 646)	7.1 (4.1–11.9)	651 352 (165 808–1 136 896)	7.5 (3.4–15.5)
Private insurance	3 238 985 (2 395 711–4 082 259)	22.5 (17.8–28.0)	3 500 317 (2 423 352–4 577 282)	29.5 (22.5–37.7)	2 155 190 (1 503 128–2 807 252)	28.0 (22.9–33.7)	2 856 843 (1 630 187–4 083 499)	32.7 (25.5–40.7)
Other†	1 745 360 (1 164 198–2 326 522)	12.1 (8.7–16.7)	662 497 (296 720–1 028 274)	5.6 (3.2–9.6)	260 957 (13 753–508 161)	3.4 (1.3–8.3)	365 701 (159 667–571 735)	4.2 (2.4–7.1)
Total‡	14 411 657 (13 389 675–15 433 639)	100.00	11 850 642 (10 828 660–12 872 624)	100.00	7 703 410 (6 681 428–8 725 392)	100.00	8 746 876 (7 724 894–9 768 858)	100.00

CI indicates confidence interval; NAMCS, National Ambulatory Medical Care Survey; and NHAMCS, National Hospital Ambulatory Medical Care Survey.

* The estimates for this group are unreliable for the time periods 1995 to 1998, 2003 to 2006, and 2007 to 2010 attributable to sample sizes being <30.

† The estimate for this group is unreliable for the time period 2003 to 2006 attributable to the sample size being <30.

‡ Totals here are less than totals for the other characteristics because of missing values; 79 383 (0.55%) in 1995 to 1998, 46 268 (0.39%) in 1999 to 2002, 62 667 (0.81%) in 2003 to 2006, and 241 102 (2.7%) in 2007 to 2010. Missing values were not included in the calculation of the percentages.

Table 2

Age- and Sex-Stratified Rates of Office Visits for Angina per 100 000 Population and 95% CIs Among Adults, by Time Period: NHAMCS and NAMCS, 1995 to 2010, United States

Office Visits for Angina	1995–1998	1999–2002	2003–2006	2007–2010
18–64 y				
Men	942.8 (721.8–1163.7)	661.6 (447.2–876.1)	457.2 (295.2–619.2)	625.7 (393.5–857.8)
Women	596.2 (419.8–772.7)	371.2 (221.7–520.8)	350.1 (211.2–488.9)	395.6 (211.9–579.3)
≥65 y*				
Men	8533.2 (6608.2–10 458.0)	7586.5 (5195.3–9977.6)	3565.0 (2322.0–4808.0)	4001.1 (1945.6–6056.5)
Women	6658.5 (5100.0–8217.0)	5292.5 (3451.7–7133.2)	3389.2 (2150.6–4627.7)	2990.4† (1804.6–4176.2)

CI indicates confidence interval; NAMCS, National Ambulatory Medical Care Survey; and NHAMCS, National Hospital Ambulatory Medical Care Survey.

*For both men and women, and in every time period, rates were significantly higher (P<0.05) for those ≥65 years of age.

†Rates dropped in a linear fashion (P=0.03) from the first time period to the last time period.

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Table 3

Selected Types of Medical Care Ordered or Provided During Physician Visits for Angina, Weighted Number of Events, and Crude Percent of Visits, by Time Period: NHAMCS and NAMCS, 1995 to 2010

	1995–1998		1999–2002		2003–2006		2007–2010	
Event	**No. (95% CI)**	**% (95% CI)**	**No. (95% CI)**	**% (95% CI)**	**No. (95% CI)**	**% (95% CI)**	**No. (95% CI)**	**% (95% CI)**
ECG ordered or provided	4 716 567 (3 162 601–6 270 532)	32.6 (25.3–40.7)	3 601 724 (1 840 290–5 363 158)	30.3 (20.6–42.1)	1 961 843 (1 274 086–2 649 600)	25.3 (18.6–33.3)	2 807 806 (1 833 907–3 781 706)	31.2 (22.4–41.7)
Stress testing ordered or provided	989 755 (545 699–1 433 811)	6.8 (4.4–10.4)	1 497 625 (930 600–2 064 651)	12.6 (9.0–17.3)	1 031 630 (621 842–1 441 418)	13.3 (9.4–18.5)	843 689 (382 467–1 304 911)	9.4 (5.9–14.7)
Referred to hospital, ED, or another physician	…	…	912 176 (537 544–1 286 807)	7.7 (4.9–11.7)	952 011 (411 946–1 492 076)	12.3 (7.4–19.6)	1 323 683 (554 898–2 092 468)	14.7 (9.2–22.9)

CI indicates confidence interval; ED, emergency department; NAMCS, National Ambulatory Medical Care Survey; and NHAMCS, National Hospital Ambulatory Medical Care Survey.

Table 4

Adjusted ORs and 95% CIs for Selected Types of Medical Services Ordered or Provided during Physician Visits for Angina: NHAMCS and NAMCS, 1995 to 2010

	ECG		Stress Test		Referred Out	
Variable	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Period						
1995–1998	1.00	…	1.00	…	…*	…
1999–2002	0.91	0.48–1.72	2.06	1.18–3.59	1.00	…
2003–2006	0.69	0.41–1.16	2.07	1.13–3.78	1.67	0.80–3.50
2007–2010	0.95	0.59–1.02	1.32	0.65–2.68	2.08	1.02–4.25
Age, y						
18–64	1.00	…	1.00	…	1.00	…
65+	0.98	0.71–1.36	0.46	0.30–0.70	1.00	0.59–1.68
Sex						
Female	1.00	…	1.00	…	1.00	…
Male	0.78	0.59–1.02	1.19	0.81–1.74	0.89	0.54–1.45

CI indicates confidence interval; ED, emergency department; NAMCS, National Ambulatory Medical Care Survey; NHAMCS, National Hospital Ambulatory Medical Care Survey; and OR, odds ratio.

* Data were not available for all years of this time period.